



Cooling Tunnel

2-Zone

Operation Manual

Table of Contents

- Important Information 3
- Equipment Safety 4
- Mechanical Installation 6
- Auto-Tracker Setup and Operation 8
- Electrical Installation 9
- Operator Controls 11
- Initial Startup Procedure 12
- Normal Daily Operation 14
- Normal Daily Shutdown 15
- Sanitation 16

- Appendix A
 - Electrical Schematic Diagrams for Glycol Tunnels. 17
 - Electrical Schematic Diagram for Refrigerated Tunnels

- Appendix C
 - Chill Plate Piping Diagrams 24

- Appendix D
 - Conveyor Belt Flow Diagram 26

Important Information

This machine operates on 3-Phase 208/230 Volts AC at 110 Amps. It is recommended that this piece of equipment be placed on its own 20 Amp breaker.

During the installation, if any holes need to be modified or added to the control panel's enclosure, it is required that steps be taken to prevent any debris from getting into the internal components of the panel. This debris can create shorts causing undesired operation or even damage the components themselves.

Even while stopped motors and air cylinders may still have power applied or may automatically start so you should be sure to follow lock-out-tag-out procedures. Make sure all power and stored energy is removed from equipment before servicing. This includes both electrical and compressed gas energy stored within and supply to this equipment.

As with any electrical or mechanical equipment, care should be taken to ensure that equipment is operated in a safe manner. Do not operate without the protective guards in place.



Equipment Safeties

This cooling tunnel has safety devices attached for the safety of the operator and service technicians.

All moving parts of motors such as chains and fan blades, as well as air cylinder pinch points are located within enclosed areas or guards. Do not operate this equipment with these guards opened or removed.

There are 4 Emergency Stop buttons located on this equipment. One located on both the control and operator panels and one on each side of discharge end. These Emergency stop buttons have guards to prevent accidental activation. If any Emergency Stop button is depressed the control power and motor power is shut off and all Emergency Stop buttons will illuminate Red to show that control and motor power are disconnected.

Main control panel is supplied with a disconnect interlock switch with a defeater function. This interlock prevents the panel from being opened while it is energized. Disconnect handle must be in the “OFF” position before opening or closing the Control Panel Door. In order to lockout the main power at this disconnect switch, simply turn the switch to the “OFF” position and press in on the red arrow in the center of the switch handle, causing a lockout slot to appear on the front of the handle and insert your lockout device. Once the lockout device is attached correctly the red arrow will stay depressed and prevent the disconnect handle from being rotated to the “ON” Position. It is recommended that a lockout device to be placed at the breaker box where the panel’s power is supplied from. As even with a lockout ability on the disconnect switch someone will have to open the door and turn the shaft which interlocks with the handle on the door and by pass this lockout.

NOTE: Bakery Technology does not recommend using this defeater as it allows for a means of electrical shock and Bakery Technology cannot be held liable for any injury or death from the use of this defeater to access the panel’s components under power. However, should an event arise which would require access to the components of the panel with the power energized the Disconnect switch is provided with a defeater function. The use of this defeater is extremely dangerous and should only be done by qualified maintenance personnel. To use this defeater press in on the white dot located on the top of the disconnect handle and pull the door open. This same method of pressing the white dot in should be used to close the panel with the power energized.

Each Motor is electrically connected to the panel through a disconnect switch with provisions for a padlock. To lock out the motor place the corresponding disconnect switch in the off position and attach your lockout device through hole provided. This will prevent the switch from being turned on as long as the lockout device is in place.

As well as having a lockout feature on the disconnect switch for each motor, the motor protection circuit breakers within the panel have a lockout capability. To use this feature follow these steps:

1. Turn main disconnect switch to the off position.
2. Locate the motor protection circuit breaker for the desired motor.
3. Turn this breaker to the "OFF" position.
4. Pull out on the tip of the motor protection circuit breaker to expose the lockout hole.
5. Place the lockout device through this lockout hole. Breaker cannot be returned to "ON" position while lockout device is present.

Note: On VFD controlled Motor it may take several minutes for VFD power to dissipate. As the motor protection circuit breaker for VFD motors also provide over current protection to these VFDs. If the Motor Protection Circuit Breaker is shut off under power please wait for VFD Displays to shut off to determine that motor circuit is de-energized.

Compressed air on tracking control should be isolated at the quick disconnect supply located at the air Trio (Lubricator, Regulator, and Oiler Combo). Once tracking system is isolated from the supply air turn regulators to their lowest setting. (Rotate Fully CCW and allow pressure to drop to Zero PSI.) When restoring air pressure make sure to set regulator at same pressure at which it was at before disconnecting of supply air. It should be noted that an air-trio is located at each end of the oven. The Trio at the infeed end does not control the discharge end and vice-versa.

Mechanical Installation

Position Tunnels so that product in feed and discharge are in the appropriate position for product flow, allowing space for all access points for easier sanitation and maintenance.

Once tunnel has been positioned in appropriate location the tunnel needs to be squared up so that the tunnel is straight and true. Failure to square up the ends of the tunnel and make sure that everything is in line can create problems with tracking of conveyor belts. The belt can be costly and expensive. Not only, the cost of replacing the belts but the downtime incurred from repairing or replacing them can make a difference so it is very important to make sure that this step is done thoroughly.

Once tunnels are set in the correct positions and squared up for product flow it should be anchored to the ground to prevent accidental movement.

Next, the height should be adjusted to make sure that product flow from one part of the line to the next is as smooth as possible. All of the legs of this equipment are equipped with a height adjustment of six inches. Turn the feet in to lower, and out to raise the height if the equipment. Make sure the tunnel is level, both side to side and end to end.

Nose bars should be adjusted to give as little space between tunnels and auxiliary equipment as possible without allowing the belts to rub on other equipment. While adjusting these nose bars, remember that these nose bars should remain square with the tunnel. This is necessary for proper control of the conveyor belt. A nose bar that is not square with the rest of the tunnel can have the same result as above when making sure that the tunnel is square and running true.

As with the nose bars the rollers on the return side (bottom) of the conveyor belt must also be square. This should apply to all rollers except the auto tracking roller. (Auto-Tracking rollers will be explained later.)

There are two Air Trios attached to the tunnel. These air trios contain a filter to remove contaminants and some moisture from the air, a regulator to adjust air pressure, and a lubricator to keep all seals and valves lubricated. Air should be fed into the filter side of the trio by means of a disconnect device, be it a ball valve or a quick disconnect. This disconnect is required in order to remove power from the pneumatic system for maintenance purposes. The reason for having two Air trios is that the pressure the auto-tracker are to be controlled separately for each end of tunnel.

The pressure the belt tension should be adjust on each side of the infeed of the tunnel. Ensure that the tension is uniform across the belt. Too much tension on one side and not the other can create tracking issues.

Conveyor belt should be installed and vulcanized by personnel trained on how to connect the ends of the belt together while keeping belt square.

The Water/Glycol mixture and/or refrigerant must be piped to the cooling coils and the chill plates if equipped. In and out flow on the chill plates is marked. The lower pipe to the cooling coil is the supply side and the upper pipe is the return. The valves which control the temperature on the cooling coils should be mounted to supply side paying attention to the direction of flow indicated on the valve.

Chill plates if equipped will require a bypass shut off valve to control flow through the chill plates, in the off state the chilled water will need to bypass the chill plates and return to the chiller unit, in order to prevent an over pressurization of supply lines.

Auto-Tracker Setup and Description of Operation

Once Conveyor belt has been vulcanized and pressure has been applied to achieve the correct belt tension. The Photo-eyes used to control the auto-tracker must be positioned so that the auto-tracker will maintain the correct position of the belt. This can be accomplished by moving the photo-eye up and down to the appropriate position via the slots on the mounting bracket and tightening the mounting screws. The brackets can be adjusted side-to-side to the edge of the desire belt position.

When positioning the photo-eyes make sure that the photo-eye does not detect any surrounding metals or frame. There is a sensitivity adjustment on each photo-eye. The max range is 100mm (3.9 inches)

Make sure that only one photo-eye on that end of the oven reads the belt at a time. If both photo-eyes read the belt at the same time the tracking will be erratic.

The Auto-Tracker air must be supplied through the appropriate air trio and be adjusted to an air pressure sufficient to overcome the belt tension while extending and retracting the air cylinders. Pressure setting will be based on belt tension setting.

The Auto-tracker air valves, switches air pressure on an air cylinders back and forth to move the cylinder in and out.

The cylinder is mounted to one end of the Auto-Tracking roller

The auto-tracking roller acts as a steering wheel for the conveyor belt. As the conveyor belt moves it might drift to one side or the other. The auto-tracking roller works to keep the belt from drifting. It works similar to a bicycle steering wheel. If the belt drifts to the right the auto-tracking roller will twist out on the right edge and in on left edge. This in essence turns the belt to left like it would a bike. If the belt drifts too far to the left the auto-tracking roller twists the opposite direction to steer the belt back to the right.

Periodically check the photo-eyes for debris buildup. Clean as necessary.

Electrical Installation

Installation of equipment should be done by authorized personnel and be performed in a manner to meet codes while at the same time provide protection from cross-contamination. This means sealed conduit must be used. All of the electrical connections should be performed by someone with experience in wiring industrial electrical systems, following all applicable codes, and utilizing proper labeling of all wires. This will make it easier for troubleshooting and repair, should an equipment failure occur, and in doing so, reduce any down time.

Uni-strut must not be used above open food product.

In exposed areas hard conduit or liquid tight conduit are the only types of conduit permitted to maintain sanitation.

It is required to cover all internal components of the panels prior to cutting any openings or holes into the panel. Failure to adhere to this rule will void the warranty on internal components. The protection of sensitive electronics during the installation of controls is required by our suppliers and should a warranty issue arise this is the first thing that is checked.

All Power supplied to panels must be protected at the source by either a breakers or fuses and provide a means of power interruption. This is in addition to the integrated disconnecting switch located within the panels.

Per the National Electric Codes proper wire sizes must be adhered to. For 480 Volts 3-Phase at 20 Amps the conductor size for main power should be no smaller than #10 AWG and must be color coded Brown, Orange, Yellow, and Green or have suitable markings to identify the correct phases of power.

All control wires must be #14AWG or larger and adhere to proper color coding for 120VAC control. (For Example: Red for 120VAC and White for Neutral)

All Motor wires must be sized to match the appropriate Full Load Current required by the Equipment. In the case of this equipment fans and conveyor drive motors must be #14 AWG or larger and compressor wires should be #8 AWG or larger. These wires must be phase identifiable.

A terminal box has been provided on the tunnels for easy installation. The terminals within these boxes have matching terminals within the main control panels. To connect the tunnels to the panels connect the panels to the terminal boxes via the appropriate conduit and connect the matching terminals with the appropriate wire type and color. (See Schematic Diagram)

Temperature Controllers require Thermocouple or temperature sensing connections. In this cooling tunnel RTDs are used. In an attempt to keep these readings as accurate as possible these should be run straight from the thermocouple to the temperature controller without and breaks or splices. In the event of this occurring make sure that all connecting wire maintain the same length.

All wiring from control panel out to the rest of the equipment has already been performed prior to shipping.

The electrical control systems were assembled and test prior to shipping. Should any problems arise after the installation re-check all connections to make sure that they match the electrical schematics and that nothing was damaged during shipping.

Operator Controls

Operator controls and their functions are as follows:

1. Emergency Stop – located at the panel and on each side of each nose bar. Provides for an immediate stop of the equipment and kills power on all electrical motors.
2. Control Power Button – located on the main control panel. Enables power to all control devices. Used to reset control functionality after a power failure or emergency stop event.
3. Fan On-Off Switch – located on operator panel. Starts Evaporator Fans. These control a particular zone as designated by label.
4. Cooling On-Off Switch – located on the operator panel. These enable the cooling function to begin. These control a particular zone as designated by label. The fan on-off selector switch for the matching zone must be in the ON position before the switch is functional.
5. Temperature control - located on the operator panel. These provide a means of controlling a set temperature. These control a particular zone as designated by label. Both the fan and cooling selector switch for matching zone must be on for the outputs of the controllers to be functional
6. Conveyor Control HMI – located on operator panel. Starts, Stops conveyor as well as controls the speed and direction of the conveyor belt.
7. Defrost Cycle Timers – If Evaporator coils are equipped with defrost heaters this controls the length of time that the heaters remain energized. Note: During the defrost cycle the Cooling function is locked out.
8. Defrost Cycle Start – This will start the defrost cycle when pressed. Note: During the defrost cycle the cooling function is locked out.

Initial Cooling Tunnel Startup

Once all tunnel installation has been done, you are ready to start up the cooling tunnel.

To start the cooling tunnel make sure that there is power at the panel and turn the disconnect switch located on the control panel door to the on position.

When power is applied to the panels control circuitry all Emergency Stop lights will illuminate. This is normal and will be the default state should a power failure occur or an Emergency Stop has been pressed. In this state all motor outputs are disconnect from the supply power. Only power for safety circuit is present on the cooling tunnel.

To control the cooling tunnel from this state it is required that the control power button be pressed. When Control power is pressed and the safety circuit is complete the Safety relay will energize. At this point the Emergency Stop button lights will turn off and the control power light will illuminate. Only when the control power light is lit will the motors and fans operate.

Note: All e-stops must be in the out position for the control power button to function

To help prevent the possibility of evaporator freezing the cooling function is locked out until the Evaporator blowers are running. These evaporator fans are 230-volt single phase with a capacitor assisted start. If there is an issue with the fans not starting first check the overload, then capacitor if these are not the problem check that centrifugal switch inside the motor is functioning correctly before replacing the motor.

To start the Evaporator fans, turn the fan selector switch to the on position for the Zone you are trying to start while the Control power light is lit. This will cause Evaporator fans to start turning and enable the cooling function, however cooling function will only be operational if the cooling selector switch is illuminated. Check for rotation.

To start the cooling function, turn the cooling selector switch while the corresponding zone's evaporator start switch is illuminated. Once both evaporator and cooling start lights are both lit the temperature controller will then control the temperature of the tunnel at the desired point. Make sure temperature drops in tunnel.

The Temperature controllers are programmed for a 3-degree hysteresis (adjustable). Controller will continue to cool until temperature matches the set point. At this point the controller will turn off the valves allowing the coolant to flow through the system until the temperature rises to 3 degrees above the set point, at which time the controller will turn on the valves to allow coolant to flow through the system again. This cycle will repeat until cooling is stopped via a stop command on the cooling or evaporator, or an event such as an Emergency stop or power failure occurs.

Start the Conveyor by pressing the Green “I” on the conveyor control HMI to verify that rotation of belt is in the correct direction. Press the Red “O” to stop conveyor. Press the up or down arrows to set the desired speed of the conveyor belt.

Note: Conveyor will not run if control power is not lit.

Normal Daily Operation

Normal daily operation should begin approximately 1 hour prior to beginning production to allow cooling tunnels to cool to temperature and stabilize.

- Make sure control panel is powered.
- Turn on control power button by pressing the white Control Power button.
- Turn on the Evaporator fans by switching fan control switches to the on position.
- If tunnel utilizes Glycol and/or chill plates the chiller unit must be turned on and pumps running.
- Turn on the Cooling function by switching cooling control switches to the on position.
- Set the desired Temperature on the Temperature controller by pressing the up or down arrows to display the desired temperature on the bottom display then press the set button.
- Press the Green “I” on the conveyor control HMI.
 - If a power failure or emergency stop event occurs repeat the steps above to restart the system.

In the event of coils icing up.

If evaporator coils ice up, switch the cooling function to the off position for tunnels using glycol or refrigerant on coil without defrost heaters, but leave the evaporator fans on. Once icing has cleared up turn cooling switch to the ON position to enable cooling again.

If the evaporators are equipped with defrost heaters make sure that the defrost timers are set to the appropriate time and press the defrost cycle start button. Once the cycle times out the cooling function will be re-enabled and tunnel will continue to cool.

Chill Plate Operation.

If your cooling tunnel includes chill plates, it should be noted that the chill plate temperature and flow are not controlled via the operator controls. In order to operate the chill plates the temperature must be set at the chiller unit and the circulation pump and any shut off valves for the flow of the glycol mixture must be controlled from there.

Daily Shut Down

To shut down the tunnel follow the following steps.

- Turn cooling switches to the off position.
- Turn fan switches to the off position.
- Press the Red "O" button on the Conveyor Control HMI

Although you can press the Emergency Stop Button or turn the main power disconnect to the off position to stop everything at once, it is not the recommended way of shutting down the Tunnel.

Sanitation

Before performing any sanitation the control system should be locked out as described earlier in this manual in the section on safety. Never open any access doors or touch any rollers, fans, or scrapers while the power is on.

Daily Sanitation

The belt and all surfaces which the top side of the belt comes in contact with should be cleaned with mild detergent and sanitized using spray bottle and towels throughout the day to prevent debris from accumulating on surfaces. These contact surfaces include rollers scrapers, and the gaskets which seal around the belt passage into and out of the cooling chamber. The accumulation of debris on these surfaces can cause tracking issues.

Catch pans (if equipped) should be removed, emptied and sanitized.

Weekly Sanitation

Open all access doors clean interior and belt with a mild detergent and sanitize belts. Make sure to clean all belt contact surfaces. This includes rollers, scrapers and seals (inside and out) at cooling chamber. Care must be taken to keep as little moisture as possible from getting soaked into the bottom surface of the belts as it is porous and could allow mold to form. It is recommended that spray bottles and towels be used for this cleaning.

Clean all coils, making sure not to damage any fins, and drain pans. Coils may be cleaned with running water as long as water does not get on underside of belt, but **do not use high pressure water** for cleaning of coils or any other surface of the tunnels.

Make sure drains are free flowing with no clogs. It is critical that the drains be free of obstruction. Not only for using running water for cleaning, but to prevent condensation from backing up into cooling chamber.

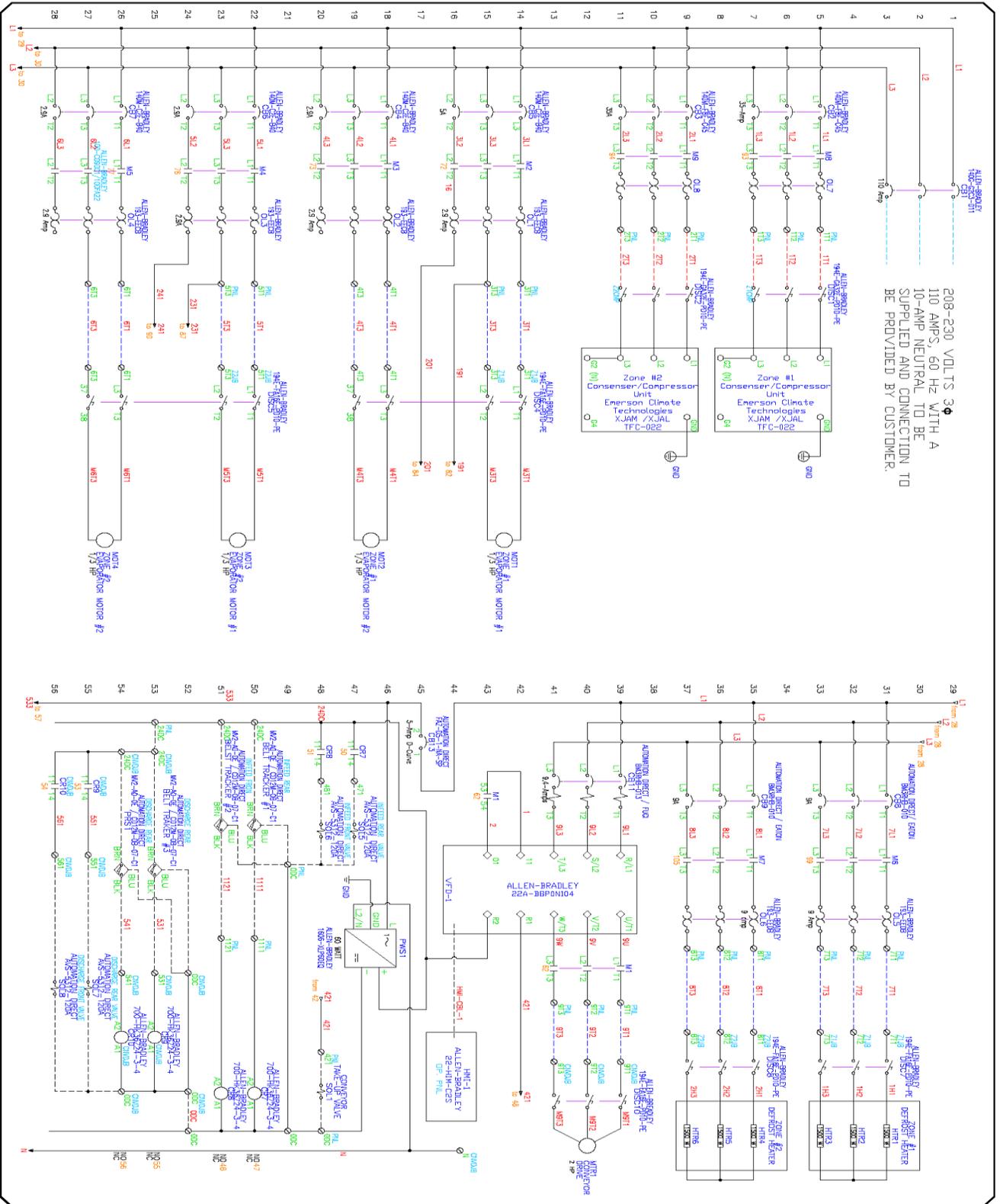
Appendix A

Electrical

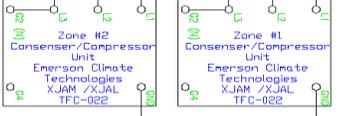
Schematics

Glycol Tunnel Schematics

Refrigerated Tunnel Schematics



208-230 VOLTS 3Ø
 110 AMPS, 60 HZ WITH A
 10-AMP NEUTRAL TO BE
 SUPPLIED AND CONNECTION TO
 BE PROVIDED BY CUSTOMER.



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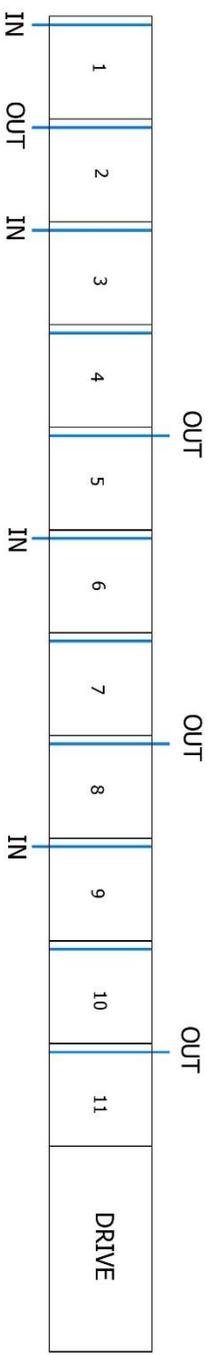
Appendix B

Chill Plate

Piping

Optional

REV	DESCRIPTION	REV'D BY	REV'D DATE	APPROVED BY
1				



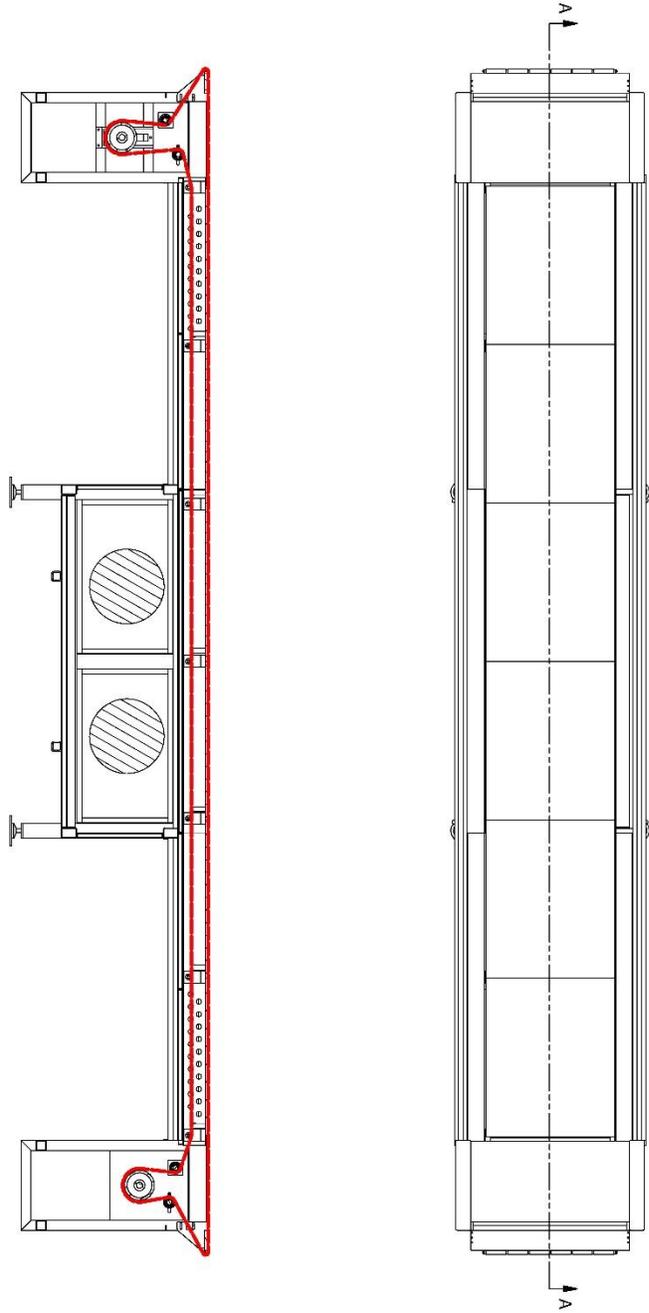
NOTE:
I. REMOVE ALL BURRS AND SHARP EDGES.

Except Where Specified: All dimensions in this document are given in inches and fractions of an inch. All dimensions are to be held to the nearest 0.001 inch unless otherwise specified. All dimensions are to be held to the nearest 0.001 inch unless otherwise specified. All dimensions are to be held to the nearest 0.001 inch unless otherwise specified.		Confidential: This document is the property of Bakery Technology, Inc. and is to be held in strict confidence. It is not to be distributed, copied, or used in any way without the written consent of Bakery Technology, Inc.	
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Appendix C

Conveyor Belt flow diagram

REV	DESCRIPTION	REV'D BY	REV'D DATE	APPROVED BY
1			7/26/2016	



NOTE:
1. REMOVE ALL BURRS AND SHARP EDGES.

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Except Where Specified: 1. Finish: Mill 2. Tolerances: ASME Y14.5 3. Material: 304 SS 4. Thread: UNC-2A 5. Surface Finish: 125 Ra 6. Heat Treatment: None	Revision 2: 1. Change: Added Section A-A 2. Change: Added Section A-A 3. Change: Added Section A-A 4. Change: Added Section A-A	Approved By: _____ Date: _____	Scale of Tolerance: As Shown Isometric: N/A	Project: 10-00091 Drawing Title: _____
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